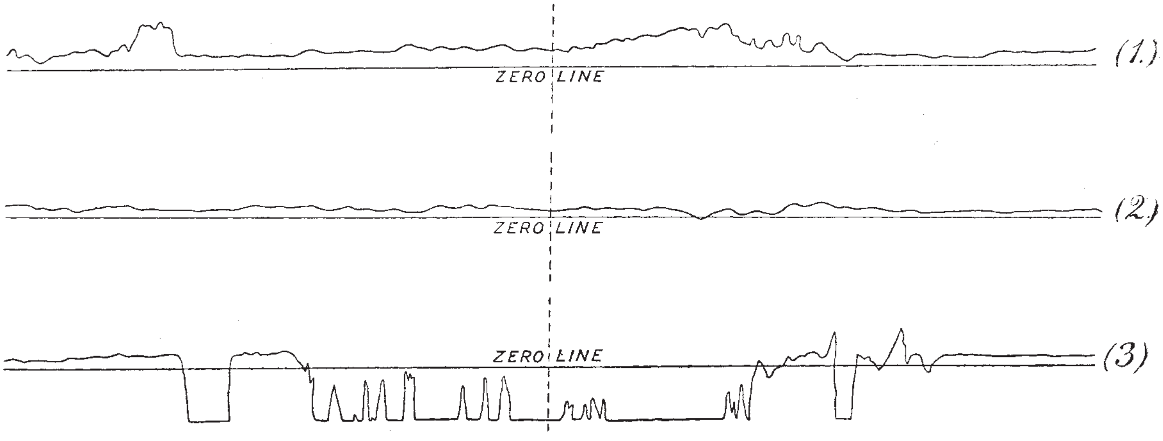
and distances measured above give positive values, and those below negative. The extreme range of the scale is equivalent to a gradient of 380 volts per metre.

Fig. 2 gives the record for a dust-storm which lasted the greater part of the day. In this figure it may be seen that the positive value never goes beyond 70 volts per metre, and on one occasion even becomes slightly negative.

Fig. 3 records a severe dust-storm which lasted from 4 a.m. until 8 p.m. The maximum value of the negative gradient cannot be inferred from the curve because the electrometer needle was deflected as far as it could go, and the horizontal portions of the curve indicate that the potential gradient was higher than the maximum which could be recorded. It will be shown presently that the gradient may reach the value of 5000 to 10,000 volts per metre when the dust is blowing thickly.

The writer has shown (*Phil. Mag.*, May, 1912) that during a dust-storm the charge upon the dust (if siliceous) is positive, while that upon the air at the same time is negative, and he was led from this to devise an electrical machine by means of which charges of both positive and negative electricity might be obtained during a dust-storm. The essential parts are:—(1) A small insulated disc coated with radium attached to a wooden rod about two metres in height; (2) a large hollow vessel with a fine wire gauze bottom; and (3) a pair of insulated spheres to serve as dischargers. The hollow vessel generally used was a five-gallon petrol tin supported upon an insulated rod at a distance of about 20 cm. above the ground, and directed with the open end towards the onrushing dust. Much of this dust is carried through, but a considerable portion is retained, and any charge it may possess is given up to the vessel. *This charge was invariably positive.*



(1) Normal fine weather record (2) a mild dust-storm; (3) a severe dust-storm.

The radium-coated conductor, however, took the negative potential of the current of air blowing past it, so that the two balls acquired opposite charges, and a torrent of sparks as continuous as that furnished by an induction coil passed between them. On some occasions the sparks reached a length of 1·5 cm., showing that the potential difference between the conductors must have been at least 40,000 volts when the apparatus was set up on the open veld.

An ordinary vacuum tube having a radium-tipped wire attached to an electrode, the other electrode being earthed, will light up brilliantly during the passage of a dust-storm. A brush discharge is seen to proceed from the electrode and the shape of the brush makes it quite clear that positive electricity is escaping from the earth into the atmosphere.

W. A. Douglas Rudge.

Induced Cell-reproduction in the Protozoa.

In the interesting letter by Mr. A. H. Drew, under the above heading, in Nature, February 20, it is suggested in the last paragraph that certain substances called auxetics which caused the development of spores in the case of new species of Polytoma, may be necessary for cell-reproduction under natural conditions in ponds, &c., where such substances would probably occur owing to the putrefaction of organic matter.

In the course of an investigation which I have recently carried out on the process of excystation in the ciliated infusorian, *Colpoda cucullus*, from its resting cysts, I have found that this organism can emerge from its cysts when the latter are incubated in 1 per cent. hay infusion (alkaline or acid in reaction) and in pure distilled water—media quite free from auxetics. The real agent which is instrumental in causing excystation is an enzyme which digests the endocyst, and thus allows the organism to swim out into the surrounding medium. As is well known, *Colpoda cucullus* is an organism of wide distribution and of common occurrence in ponds and in infusions of hay, &c. It can frequently be found among rotting grass and decaying vegetation; situations in which the products of organic decomposition and bacterial putrefaction would be plentiful, yet the cysts of this organism can be caused to rupture and yield their contents in active condition when incubated in pure water.

I would therefore suggest that it is unsafe to infer that because auxetics may serve to induce cell-reproduction in certain cases, they may be necessary in all.

The winter spores of Polytoma and the resting (dauer) cysts of Colpoda are not perhaps quite comparable, but I may point out that Colpoda most frequently encysts in the condition of the resting cyst, and that therefore if auxetics are necessary at all they ought to be required for excystation from this condition.

An account of my investigations on this subject will shortly be published. T. Goodey.

Rothamsted Experimental Station, Harpenden,
Herts, March 4.

The Spectra of Neon, Hydrogen, and Helium.

In a letter published in Nature of March 6, Prof. Fowler pointed out that a series of "parallelisms" that we gave of lines in the spectra of neon and hydrogen were probably coincidences, and could not be taken as evidence of identity. We are sorry that we did not make our meaning plainer, in our letter in Nature for February 27, for we did not mean that the lines we compared in the two spectra were

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identical. The numbers we used were by Watson, and both spectra were measured from plates produced by the same instrument, and, of course, measured by the same person; thus experimental error was eliminated so far as possible. We were, however, in hope that possibly some similarity in atomic complexity might be argued from this "parallelism." But on talking the matter over with Prof. Fowler, whose knowledge of the subject is far greater than ours, we see that the evidence is not sufficient to justify any such assumption of similarity in the atomic complexity of these two elements, and we must therefore with regret abandon the idea.

J. NORMAN COLLIE.
HUBERT S. PATTERSON.

Mountain Stream Tadpoles in Natal.

SOME readers of NATURE will be interested to learn that tadpoles with large suctorial oral discs, enabling their possessors to adhere firmly to the rocks and boulders of mountain streams, have recently been discovered at Krantzkloop, in Natal, at an elevation of about 1500 to 1600 ft. They were found by the Rev. Fr. P. Boneberg, of Mariannhill, who kept them alive for some time, and observed their peculiar leech-like habit of sticking to one's fingers or to the sides of the vessel in which they were contained. Similar tadpoles have long been known from mountain streams in Borneo and other parts of the East, but so far as I can ascertain have not previously been recorded from Africa. However, the Natal tadpole belongs to the family Cystignathidæ (genus Heleophryne), whereas those of the Oriental region belong to the family Ranidæ, so that the adaptations are no doubt quite independently evolved. A description of this tadpole will be given in the next issue of the Annals of the Natal Museum.

JOHN HEWITT.

Albany Museum, Grahamstown, South Africa,
February 1.

[IN his recently published account of the Batrachia of the Abor expedition, Dr. Nelson Annandale directs attention to some of the tadpoles (from Himalayan streams) which adhere to stones at the bottom or sides, and even in the vicinity of waterfalls. The majority adhere by their lips, which may be monstrously developed. In some other species a sucker, quite separate from the lips, and not homologous with the sucker that many young Batrachian larvæ possess, is found on the ventral surface, doubtless for the same purpose. It is interesting to note that some fishes have similar adaptations for adhesion.—ED. NATURE.]

INTERNATIONAL TIME AND WEATHER RADIO-TELEGRAPHIC SIGNALS.

IT is to the French Government that the world is indebted for the institution of an international conference on the radio-telegraphic distribution of time and weather signals. So long ago as 1908 the Bureau des Longitudes suggested a series of hourly signals from the Eiffel Tower for the determination of longitudes, and this service was brought into active operation in 1910. The great success which the service met with called for a more universal use of it, and to this end the French Government invited a certain number of foreign Governments to send delegates who had studied the problem of radio-telegraphy from the point of view of time and the determination of longitudes.

In October of last year such a conference was assembled, and programmes were formulated and resolutions passed with the object of preparing the way for the distribution of time and weather signals at stated hours from numerous selected stations suitably situated over the globe.

The outcome of this, the first international conference convened for this purpose, was a series of very important resolutions, but reference will only be made here to those that deal with the international time and weather signals. It may be of interest briefly to describe in the first instance samples of two signals that are being daily distributed at the present time, in order that the reader may compare them with the full international system which will be brought into operation on July 1 next.

Our purpose will be served if those sent out from the Eiffel Tower, Paris, and from Norddeich-Wilhelmshaven be alone considered, as these will show the different procedures adopted. To take the French signals first as recorded by a receiver in London. From this station morning and evening signals are transmitted, and at each transmission three separate "minute" signals are sent. Thus in the morning the observer can hear the tap from the pendulum clock in Paris at 10h. 45m. 0s., 10h. 47m. 0s., and 10h. 49m. 0s., and in the evening at 23h. 45m. 0s., 23h. 47m. 0s., and 23h. 49m. 0s., the clock indicating Greenwich mean time. In order to warn those who intend to receive the signals wherever they may be, a certain procedure is adopted which is the same for both morning and evening transmissions. This procedure is as follows:—

Let us suppose that we wish to correct our watch and therefore require to hear the morning signals. At about 10h. 40m. one sits by the receiving apparatus with the telephone fixed on the head, the coils set for the wave-length in use (about 2000 metres) and the detector adjusted, and waits for the preliminary signals. It may be mentioned here that the noise heard is of a powerful medium note, and the operator transmits the individual signals quite slowly so that they are easy to decipher.

The first sounds to be heard are the signal ta-te-ta-te-ta (–·–·– repeated three times, which is a "call" signal in Morse preliminary to every transmission. Then follows –···–, which means (=), a signal to separate the "call" from that which follows. The operator transmitting then sends out the following in Morse:—

·––·	·–	·–·	··	···	–––	–···	···	·	·–·	···–	·–
P	A	R	I	S	O	b	s	e	r	v	a

–	–––	··	·–·	·
t	o	i	r	e

–···–
(double dash)

···	··	––·	–·	·–	··–	–··–	····	–––	·–·	·–	··
s	i	g	n	a	u	x	h	o	r	a	i

·–·	·	···
r	e	s

·–··· ·–··· ·–··· ·–···

The last four signals indicate "wait," repeated four times.

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